allo.com

GSM Digital Telephony Card
User Manual

Safety Certification and Agency Approvals
Safety:
Emissions:
Immunity:
FCC Part 15:

Introduction to GSM Card Series Documentation

This manual contains product information for the GSM Series cards. The manual is organized in the following manner:

Chapter/Appendix		Title		Description
1		Overview		Identifies the features of your card. This chapter covers applications and uses of the GSM Series in the real world.
2		Card Installation		Provides instructions for installing the card in your PC, acquiring correct drivers, and checking device compatibility.
3		Configuration		Provides configuring options.
4		Specifications		Details card specifications.
5		Reference		Helpful Reference web sites
6		Glossary and Acronyms		Defines terms related to this product.

Table of Contents

Overview

The GSM Series cards are PCI/PCIe base cards. The GSM Series cards are designed to handle the GSM calls with Asterisk. These are the Gateway card which will interface with GSM based PSTN network with the Asterisk based IP network.

VoIP communication needs the capability to mediate between endpoints supporting different Networks, but this requires Gateway functionality.

Asterisk, is capable of terminate the some type of calls with other calls, such as terminating the SIP based IP calls with H323 based calls. But it is lacking the call terminating capability with the PSTN/GSM network.

This GSM card will add Gateway capability and provides excellent voice quality, without affecting latency or using up precious host CPU resources.

The GSM card comes with bundled software to make the product architecture independent.

The GSM Series cards are capable of handling up to 4 bi-directional GSM terminating calls. All calls are fully indemnified no additional licensing is required for their use.

Allo.com GSM card is a telephony PCI/PCIe card used for varies PBX software, e.g. Asterisk, FreeSWITCH, etc. with compatible drivers,

Features
- Capable of doing the gateway functionality.
- Suitable for PCI/PCIe 1.0 slots
- Simultaneous 4 calls can be terminated to the Gateway.
- Supports alaw codec

Card **Installation**

This chapter provides the following information:

- Unpacking the Card
- Shipment Inspection
- Slot Compatibility
- Hardware Installation
- Software Installation

Unpacking the Card

When you unpack your card, carefully inspect it for any damage if present please contact and report to Allo.com support.

Shipment Inspection

The following items are included in the shipment of the GSM card:

- GSM PCI/PCIe card.
- CD

Hardware Installation:

There are some points should be paid attention to setup GSM card.

Slot compatibility:

GSM PCI/PCIe is compatible with 32-bit 5.0V PCI slot (slot2), And PCI_exp is compatible with PCI-E ×1 slot (slot1). You should confirm your slot type, and then insert GSM_PCI Card into a PCI slot. PCI and PCI-E slots are showed as follows

PCI-E ×1 slot

32-bit 5.0V PCI slot
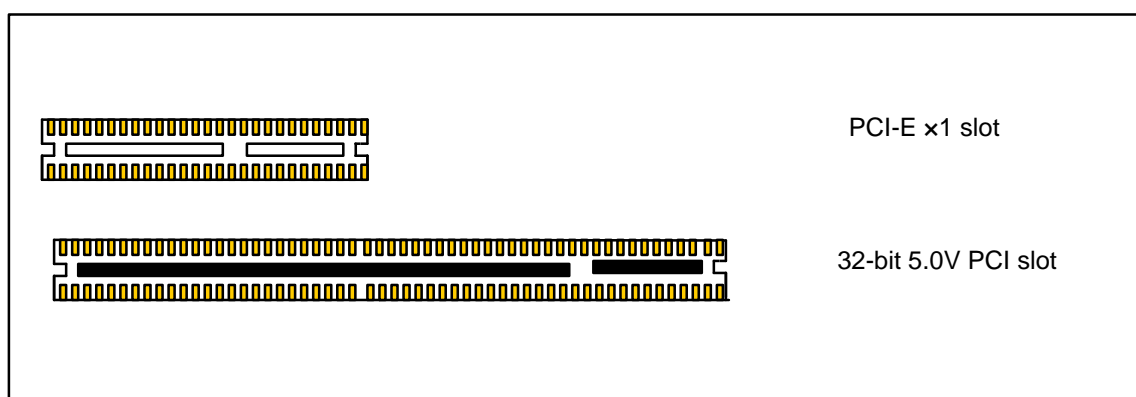
Figure: 1 slots

Indication LEDs:

There are 5 LEDs on the board. One LED for Power Indication.And 4 LED's for network status of Each SIM card.The detail explainations are as followings:
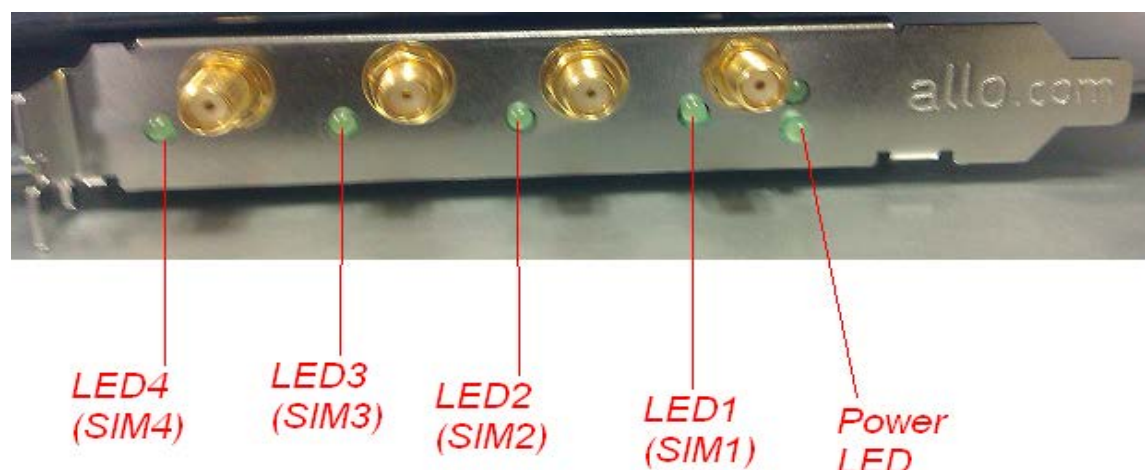
Figure:2 LED Indication

Reference	LED Status	Power Status
D3	ON	ON
	OFF	OFF

Reference	LED Status	GSM Module Status
D22,D19,D17,D13	OFF	OFF
	Permanent ON	ON; not registered on the network
	Slow flash LED ON for 200 ms, OFF for 2 s	ON; registered on the network
	Quick flash LED ON for 200 ms, OFF for 600 ms	ON; registered on the network, communication in progress
	Very quick flash LED ON for 100ms, OFF for 200ms	ON; software downloaded is either corrupted or non-compatible ("BAD SOFTWARE")

GSM modules and SIM cards

SIM cards work at the Quad-Band E-GSM/DCS/GSM850/PCS GPRS/EGPRS 900/1800/850/1900. One GSM module supports one SIM card and one antenna, please plug a SIM card into the back of a GSM module and activate it. For more details, please refer to figure 3 &4.
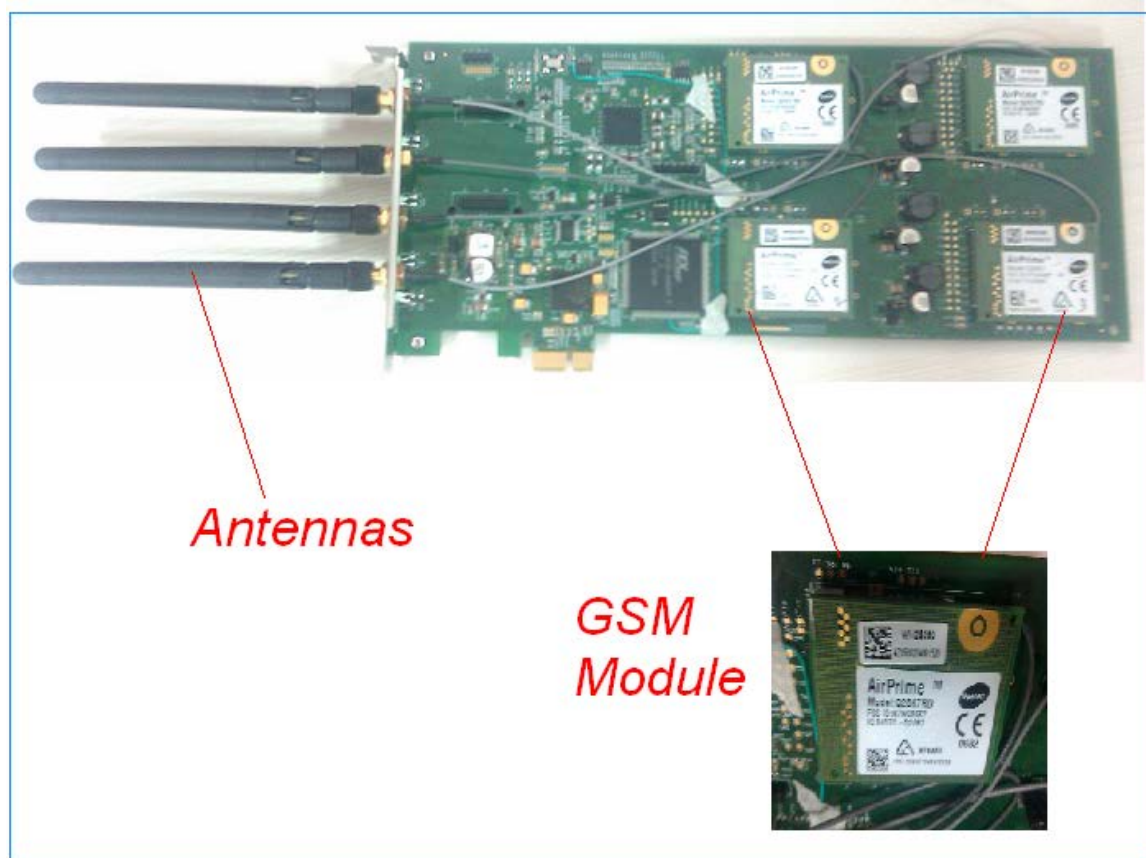
Figure:3 GSM Modules
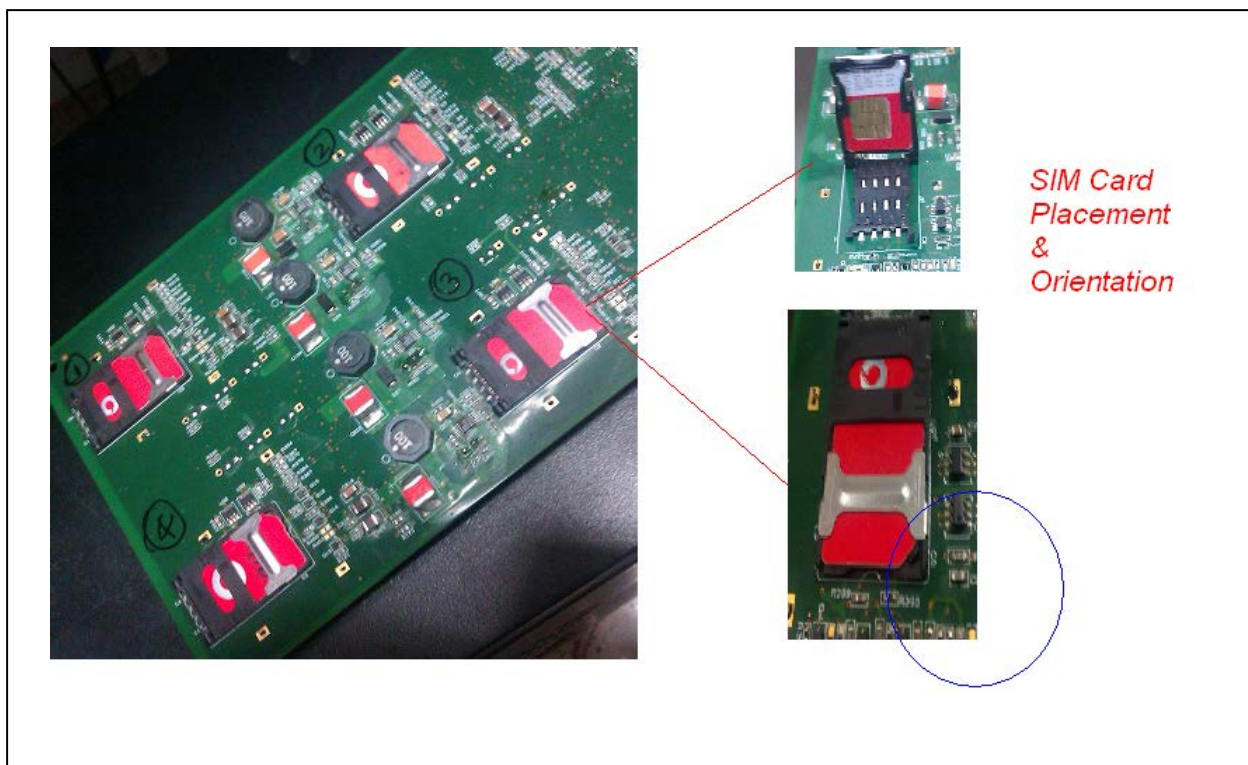
Figure:4 SIM Card placement

Introduction of GSM Module:

The Q2687 Refreshed Wireless CPU® is a self-contained E-GSM/DCS/GSM850/PCS-GPRS/EGPRS   900/1800/850/1900   quad-band Wireless CPU®. It supports a powerful open software platform (Open AT®).

Features:

- One SIM card per GSM module
- DTMF detection
- GSM data connections
- DIGITAL audio quality
- Monitors GSM signal strength by command and 4 LEDs.
- Power consumption(MAX): 30W (4 channels)
- Support external antenna

Target Applications:

- GSM connectivity for PBX
- Mobile PBX
- GSM VOIP Gateway
- SMS Gateway
- GSM Callback service

Hardware Setup procedure

- Power off your PC, remember unplug the AC power cable
- Place SIM cards for GSM modules
- Insert GSM card into a PCI slot
- Connect the antennas
- Fix the board by a screw
- Power on your PC

Figure:5 Hardware Setup

Caution: During the above processes, an ESD (ElectroStatic Discharge) wrist strap is needed. Once power is on, you must not attempt to install or take down the board. After hard ware setup, it is time to install software. Hot swapping of SIM cards can not be done when card is powered ON.

Software Installation

Allo.com Digital cards hardware are only supported under Linux. It requires drivers and libraries which are not integrated with the Linux kernel.

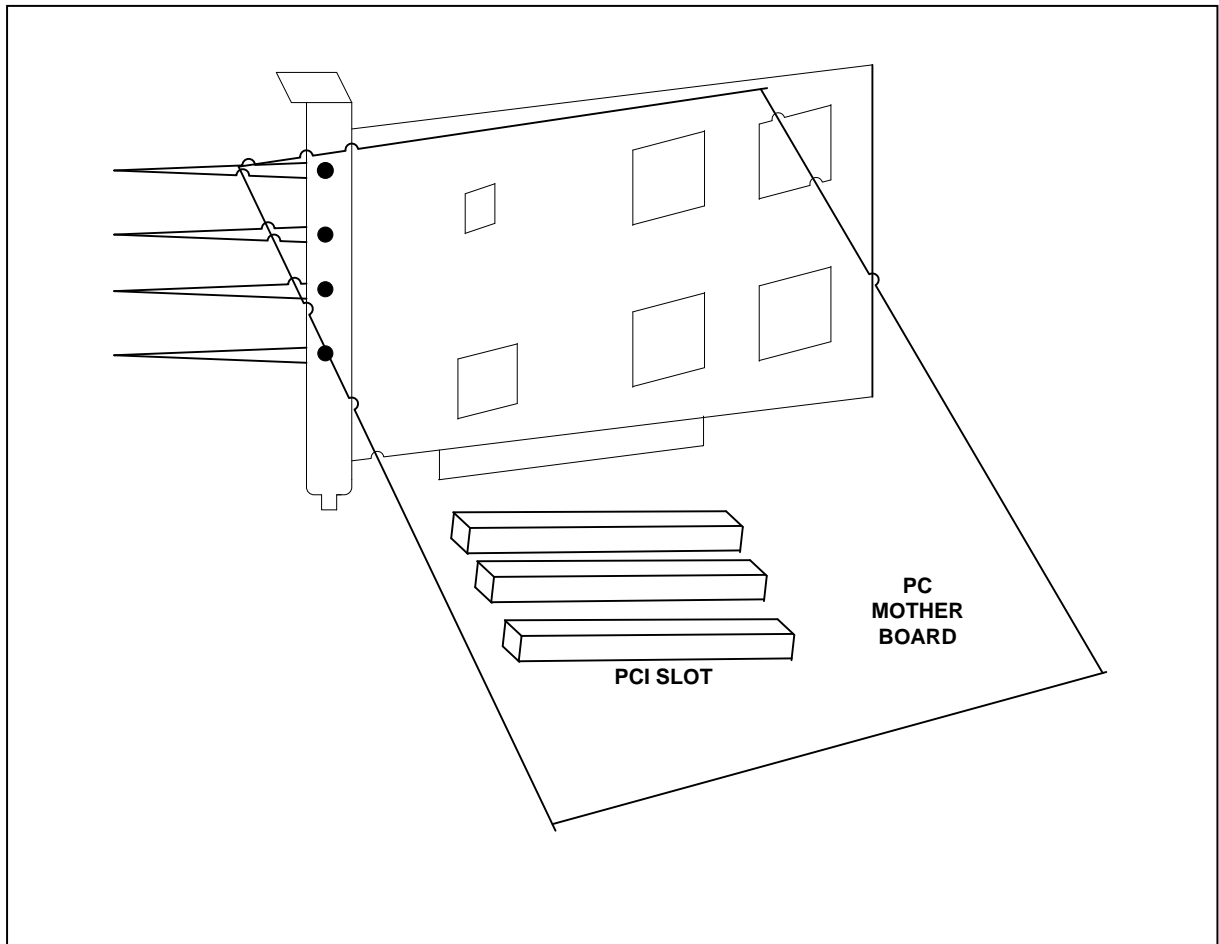Recommended Linux distribution: CentOS or Ubuntu

Drivers and application software may be obtained from Allo.com's download server provided in sections:

For an introduction to Asterisk, including additional information on its configuration, setups, and features, please refer to:

http://www.asterisk.org

To install your GSM card, you will need:

- Full Linux kernel 2.6.15 (or later) source code.
- Development libraries and headers for ncurses
- Development libraries and headers for zlib and openssl
- Development libraries and headers for newt
- GCC and standard software build tools

Installation Test Environment considered

OS	:	CentOS 5.5 (32 bit)
Kernel version	:	2.6.18-194.el5
Asterisk version	:	Asterisk 1.4.43 / Asterisk 1.8.3
Hardware	:	Allo- GSM Card
PLX PCI Driver	:	PLX9030
Modules	:	Chan GSM

Hardware detection

After inserting the card into your PCIe slot, boot your machine to linux and execute the following command to list the devices detected by the PCI bus:

```
# lspci -vvvvv
```

Confirm the output lists a device with Allo.com's PCI vendor ID which is "`PCI9030`". The output will be similar to the following:

```
root@cem-MS-7519:~#
root@cem-MS-7519:~# lspci
00:00.0 Host bridge: Intel Corporation 4 Series Chipset DRAM Controller (rev 03)
00:01.0 PCI bridge: Intel Corporation 4 Series Chipset PCI Express Root Port (rev 03)
00:1a.0 USB Controller: Intel Corporation 82801JI (ICH10 Family) USB UHCI Controller #4
00:1a.1 USB Controller: Intel Corporation 82801JI (ICH10 Family) USB UHCI Controller #5
00:1a.2 USB Controller: Intel Corporation 82801JI (ICH10 Family) USB UHCI Controller #6
00:1a.7 USB Controller: Intel Corporation 82801JI (ICH10 Family) USB2 EHCI Controller #2
00:1b.0 Audio device: Intel Corporation 82801JI (ICH10 Family) HD Audio Controller
00:1c.0 PCI bridge: Intel Corporation 82801JI (ICH10 Family) PCI Express Root Port 1
00:1c.1 PCI bridge: Intel Corporation 82801JI (ICH10 Family) PCI Express Port 2
00:1c.2 PCI bridge: Intel Corporation 82801JI (ICH10 Family) PCI Express Root Port 3
00:1c.5 PCI bridge: Intel Corporation 82801JI (ICH10 Family) PCI Express Root Port 6
00:1d.0 USB Controller: Intel Corporation 82801JI (ICH10 Family) USB UHCI Controller #1
00:1d.1 USB Controller: Intel Corporation 82801JI (ICH10 Family) USB UHCI Controller #2
00:1d.2 USB Controller: Intel Corporation 82801JI (ICH10 Family) USB UHCI Controller #3
00:1d.7 USB Controller: Intel Corporation 82801JI (ICH10 Family) USB2 EHCI Controller #1
00:1e.0 PCI bridge: Intel Corporation 82801 PCI Bridge (rev 90)
00:1f.0 ISA bridge: Intel Corporation 82801JIB (ICH10) LPC Interface Controller
00:1f.2 IDE interface: Intel Corporation 82801JI (ICH10 Family) 4 port SATA IDE Controller #1
00:1f.3 SMBus: Intel Corporation 82801JI (ICH10 Family) SMBus Controller
00:1f.5 IDE interface: Intel Corporation 82801JI (ICH10 Family) 2 port SATA IDE Controller #2
01:00.0 VGA compatible controller: nVidia Corporation GT218 [GeForce 8400 GS] (rev a2)
01:00.1 Audio device: nVidia Corporation High Definition Audio Controller (rev a1)
02:00.0 IDE interface: JMicron Technology Corp. JMB368 IDE controller
04:00.0 PCI bridge: PLX Technology, Inc. PEX8112 x1 Lane PCI Express-to-PCI Bridge (rev aa)
05:00.0 Bridge: PLX Technology, Inc. PCI9030 32-bit 33MHz PCI <-> IOBus Bridge (rev 01)
06:00.0 Ethernet controller: Realtek Semiconductor Co., Ltd. RTL8111/8168B PCI Express Gigabit Ethernet controller (rev 03)
root@cem-MS-7519:~#
```

```
03:00.0 Bridge: PLX Technology, Inc. PCI9030 32-bit 33MHz PCI <-> IOBus
Bridge (rev 01)
```

Note: The output of lspci may or may not state "Allo.com". If it does not, this does not indicate a problem.

The Allo.com card identifier should be listed. If a card identifier is not listed, then your machine is not PCI 2.2 (or higher), and the card will not work.

If card is not recognized by the system, you have to power off and take out the card, then try to insert it into another PCI slot and try again

Dependencies installation

To install asterisk in CentOS, we have to install the following prerequisite packages, along with the kernel source.

- bison
- bison-devel
- zlib
- zlib-devel
- openssl

- openssl-devel

- gnutls-devel

- flex

- gcc

- gcc-c++

Execute the following command to install the above mentioned packages on cent os:

yum install bison bison-devel zlib zlib-devel openssl openssl-devel gnutls-devel flex gcc gcc-c++

```
[root@localhost ~]# yum install bison bison-devel zlib zlib-devel openssl openssl-devel gnutls-devel flex gcc gcc-c++
Loaded plugins: fastestmirror
Loading mirror speeds from cached hostfile
 * base: centosmirror.go4hosting.in
 * extras: centosmirror.go4hosting.in
 * updates: mirrors.stuhome.net
Reducing Dag ClamAV RPM to included packages only
Finished
Setting up Install Process
Package bison-2.3-2.1.i386 already installed and latest version
Package gnutls-devel-1.4.1-3.el5_4.8.i386 already installed and latest version
Package flex-2.5.4a-41.fc6.i386 already installed and latest version
Resolving Dependencies
There are unfinished transactions remaining. You might consider running yum-complete-transaction first to finish them.
The program yum-complete-transaction is found in the yum-utils package.
--> Running transaction check
---> Package bison-devel.i386 0:2.3-2.1 set to be updated
--> Processing Dependency: gcc = 4.1.2-50.el5 for package: gcc-gfortran
---> Package gcc.i386 0:4.1.2-51.el5 set to be updated
--> Processing Dependency: cpp = 4.1.2-51.el5 for package: gcc
--> Processing Dependency: libgcc >= 4.1.2-51.el5 for package: gcc
---> Package gcc-c++.i386 0:4.1.2-51.el5 set to be updated
--> Processing Dependency: libstdc++-devel = 4.1.2-51.el5 for package: gcc-c++
--> Processing Dependency: libstdc++ = 4.1.2-51.el5 for package: gcc-c++
---> Package openssl.i686 0:0.9.8e-20.el5_7.1.0.1.centos set to be updated
---> Package openssl-devel.i386 0:0.9.8e-20.el5_7.1.0.1.centos set to be updated
---> Package zlib.i386 0:1.2.3-4.el5 set to be updated
---> Package zlib-devel.i386 0:1.2.3-4.el5 set to be updated
--> Running transaction check
---> Package cpp.i386 0:4.1.2-51.el5 set to be updated
---> Package gcc-gfortran.i386 0:4.1.2-51.el5 set to be updated
--> Processing Dependency: libgfortran = 4.1.2-51.el5 for package: gcc-gfortran
---> Package libgcc.i386 0:4.1.2-51.el5 set to be updated
```

Compiling & Installation of Asterisk

For using Asterisk for your application, follow the steps below.

1. Download the latest release version of Asterisk. Substitute the version of Asterisk for the 1.4.43 in the command below.

```
#wget
http://downloads.asterisk.org/pub/telephony/asterisk/re
leases/asterisk-1.4.43.tar.gz
```

```
[root@localhost temp]#
[root@localhost temp]# wget  http://downloads.asterisk.org/pub/telephony/asterisk/releases/asterisk-1.4.43.tar.gz
--2012-02-22 14:42:19--  http://downloads.asterisk.org/pub/telephony/asterisk/releases/asterisk-1.4.43.tar.gz
Resolving downloads.asterisk.org... 76.164.171.233, 2001:470:e0d4::e9
Connecting to downloads.asterisk.org|76.164.171.233|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 21708497 (21M) [application/x-gzip]
Saving to: `asterisk-1.4.43.tar.gz'

100%[======================================================================>] 21,708,497   116K/s   in 6m 17s

2012-02-22 14:48:37 (56.3 KB/s) - `asterisk-1.4.43.tar.gz' saved [21708497/21708497]

[root@localhost temp]#
```

For 1.8.3

```
#wget
http://downloads.asterisk.org/pub/telephony/asterisk/re
leases/asterisk-1.8.3.tar.gz
```

```
[root@localhost temp]#
[root@localhost temp]# wget http://downloads.asterisk.org/pub/telephony/asterisk/releases/asterisk-1.8.3.tar.gz
--2012-02-22 14:50:53--  http://downloads.asterisk.org/pub/telephony/asterisk/releases/asterisk-1.8.3.tar.gz
Resolving downloads.asterisk.org... 76.164.171.233, 2001:470:e0d4::e9
Connecting to downloads.asterisk.org|76.164.171.233|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 26806503 (26M) [application/x-gzip]
Saving to: `asterisk-1.8.3.tar.gz'

100%[======================================================================>] 26,806,503   151K/s   in 4m 47s

2012-02-22 14:55:45 (91.3 KB/s) - `asterisk-1.8.3.tar.gz' saved [26806503/26806503]

[root@localhost temp]#
```

2. Expand the downloaded file, compile and install. Substitute the version of Asterisk for X.X in the command lines below.

```
# tar -zxvf asterisk-X.X.X.tar.gz
```

```
# cd asterisk-X.X.X/
```

```
# ./configure
```

```
# make menuselect
```

```
# make
```

```
# make install
```

```
# make samples
```

GSM Driver Installation

To install the Linux support files, use the following steps:

1. Download the gsm driver from the link http://www.allo.com/firmware/gsm-card/allo_gsm_driver.tar

2. Copy the tar file to /usr/src

3. Extract the file using "tar –xvf allo_gsm.tar"

4. Change the prompt to allo_gsm directory "cd allo_gsm"

5. Run the script "./install.sh <asterisk source directory path>", so that the driver installation will be done automatically

6. Run the asterisk (#asterisk -cvvvvvvv), you can also run asterisk in silent mode (#asterisk).

Manually Load chan_gsm driver

Start Asterisk and load the GSM Gateway Card with the following command (usually asterisk will load the module by default, unless it configured as not to load in the modules.conf), and also check whether GSM Gateway card is located; also output of the command is shown below.

Note1: Make sure the gsm module is loaded by default; this can be checked by giving the following command

Note2: Please make sure the provided sample configuration files are present before starting asterisk

```
 *CLI> module show like chan_gsm.so
```

If the module is not loaded key in the below command

```
 *CLI> module load chan_gsm.so
```

Now you can able to use the GSM Card with the Asterisk.

Sample Configuration

Configuration file required for GSM card,

1. Gsm_additional.conf

2. Gsm.conf

3. Extensions.conf

4. Sip.conf

Gsm_additional.conf and gsm.conf were automatically generated by the script.

Extensions.conf and sip.conf will be generated by Asterisk installation where we have to modify the dialplan to make outgoing and incoming calls.

Sample extensions.conf

[out_gsm_gsmout]

exten => _11.,1, ,Dial(GSM/1/${EXTEN:2})

exten => _11.,2,Hangup

exten => _12.,1, ,Dial(GSM/2/${EXTEN:2})

exten => _12.,2,Hangup

exten => _13.,1, Dial(GSM/3/${EXTEN:2})

exten => _13.,2,Hangup

exten => _14.,1, Dial(GSM/4/${EXTEN:2})

exten => _14.,2,Hangup

[gsm-incoming]

exten=s,1,Dial(SIP/4000,80,Ttr)

exten=s,n,Hangup()

Sample sip.conf

[4000]

type=friend

nat=yes

host=dynamic

allow=all

Checking GSM modules & SIP peers using asterisk CLI

After installing the chan_gsm.so module, you can check the gsm modules which you have enabled in the configuration. As shown in following command.

```
*CLI> gsm show status

Port Status InUse Provider Home Zone Signal Quality
1 (0) REGISTERED n "Rogers Wireless" y -82dbm
2 (0) REGISTERED n "Rogers Wireless" y -82dbm
3 (0) REGISTERED n "Rogers Wireless" y -82dbm
4 (0) REGISTERED n "Rogers Wireless" y -67dbm
```

The fields here can be detailed as follows:
* Port column is the index to the GSM port.
* Status should be REGISTERED.
* InUse column indicates if the GSM port is busy.
* Provider gives the name of the provider.
* Home Zone indicates if we're registered to our regular provider.
* Signal Quality indicates how good the signal reception is.

For signal quality, we can translate the measurements as follows:
not measurable (not measured yet)
-112 dbm is very low
-97 dbm is low
-82 dbm is ok
-67 dbm is good
-52 dbm is high
-51 dbm is very high

Similar to above command many other at commands can also be used as bellow,

gsm send at <port> "<command>"

where port is the gsm port, command is "at+csq" for checking signal strength.

Similarly we have many at commands which we can give as commands. (at commands are generic gsm at commands which can be searched in the internet)

Check the IP extensions registration status using the following command,

```
*CLI> sip show peers

Name/username    Host            Dyn Nat ACL Port      Status

5002/5002       192.168.0.139    D   N       5064      Unmonitored

5001            192.168.0.143    D   N       5065      Unmonitored

5000/5000       192.168.0.139    D   N       5062      Unmonitored

4000/4000       192.168.0.143    D   N       5062      Unmonitored

4 sip peers [Monitored: 0 online, 0 offline Unmonitored: 4 online, 0
offline]

*CLI>
```

Limitations

Allo.com GSM Gateway card comes with some of limitations, which are listed below;

1. Gateway card are only using G711 a law codec.

Specifications

This chapter provides specifications, required environmental conditions for the GSM Gateway Series cards.

Physical card dimension	Size : 63.5 mm (height) ✕ 94.3 mm (Length)
Interfaces	PCI Express Bus - Compliant with PCI-E X1 1.0 or greater.
Environment	Temperature: 0 to 50° C (32 to 122° F) operation -20 to 65° C (4 to 149° F) storage
Humidity	10 to 90% non-condensing
Supported Codecs	α-law (a-law)

Hardware and Software Requirements

400 Mhz Pentium III or better

512 MB RAM

Available PCI-E Slot (as described previously)

Linux 2.6 kernel

Reference

http://allo.com

http://www.asterisk.org

http://www.voip-info.org

Glossary and Acronyms

a-law

Mainly used in European telephone networks for the conversion between analog and digital signals in PCM applications. Similar to the North American mu-law standard.

GSM

The abbrivation is the Global System for Mobile Communications. It is a standard set developed by the European Telecommunications Standards Institute (ETSI) to describe technologies for second generation (or "2G") digital cellular networks. Developed as a replacement for first generation analog cellular networks, the GSM standard originally described a digital, circuit switched network optimized for full duplex voice telephony.

PCI peripheral component interconnect

A standard bus used in most computers to connect peripheral devices.

AT Commands

AT commands are used to control MODEMs. AT is the abbreviation for Attention. These commands come from Hayes commands that were used by the Hayes smart modems. The Hayes commands started with AT to indicate the attention from the MODEM. The dial up and wireless MODEMs (devices that involve machine to machine communication) need AT commands to interact with a computer. These include the Hayes command set as a subset, along with other extended AT commands.

Asterisk

Asterisk is an open source framework for building communications applications. Asterisk turns an ordinary computer into a communications server. Asterisk powers IP PBX systems, VoIP gateways, conference servers and more. It is used by small businesses, large businesses, call centers, carriers and governments worldwide. Asterisk is free and open source. Asterisk is sponsored by Digium

ESD

Electrostatic discharge is a serious issue in solid state electronics, such as integrated circuits. Integrated circuits are made fromsemiconductor materials such as silicon and insulating materials such as silicon dioxide. Either of these materials can suffer permanent damage when subjected to high voltages; as a result, there are now a number of antistatic devices that help prevent static build up.